Commercial Motor (archive)

Article originally printed in the edition of **27th July 1962**.

CONTINENTAL TYPE BRISTOL P.S.V. CHASSIS

RESEMBLING certain current Continental types more than contemporary British designs, a highly inspired 36-ft. x 8-ft. 2.5-in, single decker passenger chassis has been developed by Bristol Commercial Vehicles Ltd, Brislington, Bristol, 4, for use with 54/56-seat bus or 47-seat coach bodies to be built by Eastern Coach Works Ltd, Lowestoft.

Known as the RE, this new Bristol chassis has a horizontal Gardner engine mounted below the frame and behind the rear axle, air suspension at both axles and an air-hydraulic dual-circuit braking system.

There are two versions of the new model, these differing principally only in respect of frame height: the RELL low frame chassis has been designed for stage-carriage bodywork and the chassis frame height forward of the gearbox is 3 inches lower than that of the RELH coach body model. The RELL has a chassis height of 25 inches ahead of the front axle and 28.75inches immediately behind the rear axle whereas these respective dimensions in the case of the RELH are 18inches and 31.75inches, the difference being accounted for by slight cranking of the main frame members immediately ahead of the rear-suspension pivot points. The deter frame line of the coach chassis permits an underfloor full-width luggage locker between the axles. The frame height in the immediate vicinity of the rear axle is the same 36.25inches in both uses a 19foot wheelbase.

The RE design has a wheelbase of 9 ft. and front and rear overhangs of 9foot 7.5inches. and 10 foot 4.5inches respectively. The pressed channel-section side members are 10inches x 2.75inches x 0.25inches, tapering 3 6.25inches deep at the front. There are six channel-section and three tubular cross-members bolted in place, and the low-frame version incorporates body plan outriggers.

The standard power unit is the Gardner HLX rated to give either 150-b.h.p. or 120-b.h.p. at 1,700 r.p.m. Alternatively, se Gardner 6111.W 112-b.h.p. unit can be installed, with the further option of horizontal versions of the Bristol BVW diesel set to match any of the Gardner ratings. The engine faces to the rear and carries an air-assisted 16.25-inch diameter clutch, from which a shaft runs forward, above the Lodekka-type dropped-centre rear axle, into the five speed synchromesh gearbox. This box, which incorporates an air-assisted gear change, has forward ratios of 4.07, 2.3, 45, 1 and 0.70 to 1. with an optional at top-gear ratio of 4.7 to 1: reverse is 1 to l.

From the output of the gearbox a short shaft with **Hardy Spicer 1600-series joints** (as opposed to the **1500series joints of the engine' gearbox shaft**) takes the drive into the front of the axle, the alternative ratios of which are 4.36, 4.77 or 5.6 to 1. The front axle is a Bristol assembly of conventional design, and **Burman recirculating-ball steering** is employed.

Following satisfactory service life with air suspension at the rear axles of Lodekka double deckers, on which this suspension is standard, and on a number of MW single-deckers, Bristol have decided to adopt full air suspension as standard for their RE Models. The front suspension is by a single rolling-lobe diaphragm type air spring at each side of the frame, with axle location by trailing radius arms and a lower tie -rod. At the rear there are two rolling-lobe air springs at each side of the frame, one behind and one in front of the axle, and a pair of long trailing radius

-arms. Panhard rods provide lateral location at both axles, no delay levelling valves are used, and heavy-duty dampers are incorporated. Bristol cam brakes 16.5inch x 4inch at the front and 16.5inch x 7.5inch at the rear - give a total lining area of 575 square inches. These are operated by an air-hydraulic .system which consists of an air servo and a 2-inch-bore hydraulic master cylinder to actuate the frame-mounted rear-brake slave cylinders, and an air-hydraulic "power pack" controlled by the rear brake servo and actuating stub-axle mounted slave cylinders, the two circuits being independent of each other.

An exhaust brake is offered as an optional extra, service experience with this having confirmed improved lining life and reduced adjustment frequency. The electrical system is 24v., the four batteries being carried on the left side of the chassis, ahead of the rear axle. D.C. or A.C. generators can be fitted. The fuel tank, has a capacity of 34 gal., and is carried ahead of the right-hand rear wheel.

The weight distribution of the RE design is such that **9.00-20 (12-ply) tyres** can be used all round.

The two different types of body have basically the same structure, high-duty aluminium alloy being used throughout, with the exception of the timber flooring. The bus body has power-operated double doors ahead of the front wheel and is available with either 54 or 56 seats. Fluorescent lighting is provided, and body heating is given by the forward-mounted radiator in conjunction with an exhaust heat-exchanger.

The coach body, which can seat 47 when standard coach seats are employed, but a reduced number if reclining seats are fitted, has a single inward-opening door and a total of 130 cu. ft. of luggage accommodation, most of which is under the floor. Both vehicles have deep, full width wrap-round windscreens and paired headlamps, features which give improved driving safety, whilst it is obvious that the predominance of powered controls will make the RE a light vehicle to handle.

Various other changes to the Bristol range have been announced also, the most important of these being that the maximum-capacity tractive unit is now being fitted with a Gardner 6LX 150b.h.p. diesel engine and David Brown 657 overdrive-top constant-mesh gearbox, as an alternative to which a Bristol six-speed box will be offered in due course, The flat-floor Lodekka chassis remains basically unchanged, except for the adoption of a different radiator grille, whilst minor changes have been made to the Bristol BVW six-cylinder diesel engine, mainly by way of cleaning up the design.

Commercial Motor (archive)

Article originally printed in the edition of **25th October 1963**.

REAR-ENGINED COACHES IN PRODUCTION

TEN new Bristol RE coaches now going into service with the Bristol Omnibus Co. Ltd. represent the first production versions of the new rear-engined single-decker design of Bristol Commercial Vehicles Ltd. Built to the maximum dimensions of 36 ft. by 8 ft. 2+ in., they incorporate an underfloor engine mounted horizontally behind the rear axle, with the drive carried forward to a synchromesh gearbox ahead of the axle. The chassis is based on a design fully described in The Commercial Motor of July 27, 1962.

All main framing of the **Eastern Coach Works Ltd.** body, of which other examples are now going through the Lowestoft works, is of **aluminium alloy**, **with timber inserts** where necessary to secure the panels. **Flooring is of timber**, whilst the **front and rear corner panels and domes are of reinforced plastic** construction. Seating is provided for 47 passengers, on well-spaced, comfortable seats. The Bristol Greyhound version has full headrolls, but the same basic seat is also available without headrolls, or a lower-backed version can be supplied according to individual customers' requirements. Trimming of the seats is in a new Hyfflon moquette on the Bristol coaches, though again the final choice of material depends on the operator.

Sealed glazing is standard on the new Bristol coach, ventilation being provided by a **Smiths individual jet-vent system**, with inlet vents in the canopy beneath the front dome leading to trunking along the centre of the **glass-fibre luggage racks**. Heating is provided by an adaptation of the Cave-Brown-Cave system, cold air entering through a thermostatically controlled varivane screen behind the ornamental front radiator grid. Two **Clayton Dewandre** re-circulatory heaters are fitted beneath the seats, insulated piping to these heaters being carried beneath the floor.

Fluorescent lights are mounted beneath the luggage racks adjacent to each pair of seats and are fitted with individual switches. These are augmented by four fluorescent fittings above the gangway. Two **Weathershields opening sky-lights** and two fixed sky-lights in the roof provide additional natural light.

Two intake louvres mounted on the roof at the rear, with ducting carried down the inside of the body on either side of the rear window, provide air intakes to the engine.

Access to the engine is by floor traps inside the body, or hinged flaps immediately behind the rear wheels. The rear engine reduces the amount of space available in the rear luggage boot to 30 cu. ft., and additional luggage space is provided under the body between the axles with access by hinged flaps on either side of the body. This gives 95 cu. ft. capacity if a spare wheel is carried, or 105 cu. ft. without. The spare wheel is carried on the offside immediately ahead of the rear wheel. All body side flaps are of glass-fibre plastics construction, with rubber hinges.

A glass screen is now fitted behind the driver, and a blind to prevent reflection from the lights is fitted on both sides of the body at the front.

Window inserts are of Formica, and the window frames are of **polished alloy** with the **cream rubber window glazing,** now so characteristic of E.C.W. products. **Treadmaster floor** covering in a colour to match the interior trim is provided, and all rails and stanchions are of **stainless steel.**

An indication of the popularity of this new model amongst Tilling group operators can be seen from the orders for the 1963 sanction, which total 31. In addition to the 10 for Bristol, the following operators are also taking them: Crosville (4), Eastern Counties (3), Eastern National (7), Lincolnshire Road Car (2), Thames Valley (2), United Welsh (2). An "express car" (or service coach) version of the Bristol RELH will be based on the coach body (unlike the MW, which is a luxury trimmed version of the stage bus), and 27 of these are included in the 1963 sanction, including United Automobile Services (10), Eastern National (8), Lincolnshire Road Car (2), Midland General (3), and United Counties (4). This gives a combined total of 58, compared with 102 MW type coaches for 1963. It must be remembered, of course, that the MW is only a 30-ft. coach, and this length still remains the most popular in many fleets.

In addition to the RELH coach, 43 RELL stage buses are also being constructed under the 1963 sanction, and are made up of 25 for United Auto., 5 for Durham District Services, 3 for Eastern National, 4 for Lincolnshire Road Car, 3 for Thames Valley and 3 for West Yorkshire.

Commercial Motor (archive)

Article originally printed in the edition of **4th November 1966**.

BRISTOL RE SINGLE-DECK BUS CHASSIS

By A. J. P. WILDING, AM I Mech E, MIRTE

SINCE Bristol Commercial Vehicles Ltd re-entered the open market for passenger vehicles about a year ago, it has considerably revised its vehicle-building programme. It has dropped some models and for single-decker work the main offering is the **RE** with the only other Bristol chassis suitable for this class of bodywork a version of the VR introduced at the Commercial Motor Show.

Most of the RE changes have been connected with paring down the standard specification to bring it more into line with general British bus manufacturing practice. When Bristol sold only to the Transport Holding Co., such things as air suspension, semi-automatic transmission and copper piping were standard because the nationalized bus companies invariably required these items. Now these are optional, and less expensive components are standard. As a result, the list price of the RE is competitive. And a test of an example from the range of chassis offered shows the design to be competitive too in respect of performance, fuel economy and braking. Fuel consumption figures obtained were very good indeed and braking performance was excellent. The test chassis proved to be light to handle and adequately manoeuvrable and the vehicle had a lively general performance.

The actual model tested was the RELL, the last two letters meaning "long" and "low" and referring to chassis length and frame height. The RELL has a wheelbase of 18 ft. 6 in. and is intended for 33 ft. to 36 ft. long bus bodywork and as well as this model there is a coach version and RE bus and coach chassis with wheelbases of 17 ft. 6 in. (for 32 ft. 6 in. to 36 ft. bodies) and 16 ft. 2 in. (for 30 ft. 6 in. to 33 ft.-long bodies). Bus versions have their frames dropped forward of the rear axle as on the test chassis while coach versions have level frames 3.25 in. higher at the forward end.

The RE has a rear horizontal engine and this drives over a dropped-centre rear axle to the gearbox which then drives back to one side of the axle. A **Gardner 6HLX** 10.45 litre engine was fitted in the chassis tested, this being an option with the Gardner 6HLW to the standard power unit which is a **Leyland 0.600** diesel. The 6HLX produces 150-b.h.p. at 1,700 r.p.m., maximum

output of the 6HLW is 112-b.h.p. at 1,700 r.p.m. and the Leyland unit can be obtained with alternative ratings of 130-b.h.p. at 2,000 r.p.m. or 125-b.h.p. at 1,700 r.p.m. Standard transmission is through a Bristol five-speed overdrive synchromesh gearbox but here again the test chassis was different as it was fitted with the optional **Bristol Self-Changing Gears semi-automatic transmission** unit. This has an overdrive top ratio but no direct-drive gear whereas a four-speed unit of the same type that is a second option has direct drive top.

Another way in which the test chassis differed from the standard specification was that air suspension was incorporated as against the **now standard leaf-springs**. A **Firestone Airide** system is used by Bristol with single rolling-diaphragm air-spring units at each side of the frame for both the front and rear axles. At the front, air springs operate between frame brackets and support beams carried by the front axle, the support beams extending forward to frame mounted pivots and in conjunction with lower tie rods form parallel trailing linkages which position and control the axle longitudinally.

Lateral location of the front axle is by a rubber-bushed Panhard rod and a similar rod is used at the rear. But at the rear the spring units operate between frame brackets and the rear ends of flexible beams (with the appearance of leaf-springs) clamped to the underside of the rear axle casing and pivoted at the forward end in frame brackets. The arrangement at the rear locates the axle positively and accommodates brake and driving torque reactions.

With the introduction of the various changes to the RE design the model is designated the Series 2 and so far none of these is in service. One important way in which the present design differs from its predecessor is that a **full air-pressure braking system** is used with separate circuits for the front and rear axles instead of the earlier' air-assisted hydraulic layout. Brake actuation is by single diaphram chambers all round, those at the rear acting through a brake cross-shaft to which the handbrake rod is also linked.

All the tests were carried out in the Bristol area and at airfield west of Bath used by Bristol for development testing.

The weather at the time of most of the tests was dry but it was cold with the maximum temperature at any time, 13 deg. C (55 deg. F). Fuel consumption tests were carried out first to give the stretch planned for brake tests time to dry out after early morning rain. The perimeter track of the airfield was used for these, two laps of the 3-mile circuit being made. Against the usual belief, the perimeter circuit of this particular airfield was far from being flat, having some slight undulations for most of the way and one fairly long (300 yards) gradient. I would say that as far as fuel consumption testing was concerned the circuit was comparable to others frequently used for COMMERCIAL MOTOR tests. Unfortunately, the RE was not loaded to its maximum designed weight. The gross figure of 10 ton 6 cwt. was 17 cwt. short of this which must be taken into account when considering the consumption figures obtained. Another point which must be taken into account is the fact that the RE was tested in chassis form, with a body there would have been increased wind resistance which would have reduced the figures obtained. But wind resistance would only have been a factor in the steady-speed runs with less effect on the two stops per mile consumptions and virtually none on the six stops per mile tests. It is difficult to assess the consumption that an operator would obtain with an RE on stage-carriage work because conditions, loading, terrain and so on vary so widely but I think it would be safe to assume that with the layout as on the test chassis between 11 and 13 m.p.g. should be obtained.

Acceleration tests followed the fully-laden consumption tests on the first day and the RE put up a good performance on these. The fitting of semi-automatic transmission helped in producing good times for the through-the-gears runs---they were as good as figures obtained with p.s.v.

running at higher power-to-weight ratios tested previously. On the runs from 10 m.p.h. the top, overdrive, ratio in the gearbox was used because this unit did not have a direct drive and fourth ratio gave a maximum speed of only 39 m.p.h. These runs are comparable with direct-drive runs in chassis having a rear axle ratio of 3.35 to 1 and therefore the times obtained were commendable. The engine pulled without hiss from speeds as low as 8 m.p.h. in top gear.

When the tarmac on the airfield had dried out brake tests were completed and very good figures as recorded in the results table were obtained. The stopping distances were shorter than on p.s.v. chassis of the same type tested recently and represent actual efficiencies—from the point that the pedal was first pressed to a point at which the vehicle stopped—of around 60 per cent. These compare with Tapley meter readings for maximum deceleration of 70 per cent from 20 m.p.h. and 67 per cent from 30 m.p.h. that were recorded on the stops and show that there was little delay in the system. The Tapley meter reading obtained for handbrake tests was 37 per cent which is very high indeed and this in spite of the fact that the handbrake could have done with some adjustment as the lever was right back and a bit awkwardly placed for the application of full effort when in the "on" position.

Having less load on the chassis than it is designed to carry would have helped in giving improved figures but against this must be set the fact that the chassis had only done 72 miles on the road so that the brakes could not have been fully bedded in. The test vehicle was the Show exhibit by Bristol at Earls Court last month so it had covered much more distance—but on the back of a semi-trailer. A notable aspect of the brake tests was that there was no locking of the wheels to speak of. On only one stop was there a mark on the road and this was from one of the front wheels which could have been due to a patch on the surface of the road with low adhesion. Even when getting the high handbrake retardations there was no marking by the rear tyres.

We had a lot of difficulty in finding a suitable hill for gradient performance tests in the area around Bath and Bristol and eventually settled for one a little way to the north of Wells, Somerset. Exact details of the average gradient could not be obtained but I would estimate it to be about 1 in 12. The length was 0.8 miles and the maximum gradient 1 in 8, this being the figure for at least half the hill. Although not as steep as those normally used on CM tests, the results are reasonably comparable. Total time for a maximum-power ascent was 2 min. 56 sec. and on the climb second gear was the lowest used—for 1 min. 41 sec.—and the minimum road speed was 14 m.p.h. Brake fade characteristics were assessed on the hill by making a run down in neutral with the brakes applied to keep the speed to 20 m.p.h. After a run lasting 2 min. 12 sec. a maximum pressure brake stop at the bottom produced a Tapley meter reading of 57 per cent which showed that there had not been enough fade to worry about.

A steeper hill was required for stop-and-start and handbrake holding tests and this was eventually found close to Bristol. The gradient was 1 in 6 and the RE handbrake held the chassis easily both facing up and down the slope. Easy restarts in these positions were made in first and reverse. The steeper hill, although somewhat severe by our normal standards, would have been satisfactory for the hill-climb and fade tests but by the time it was found the rush hour was on in Bristol and the high volume of traffic on the hill made repeat tests impracticable. However, in climbing to the steepest section and then to the top to turn round, the RE showed a more than adequate performance.

The final figures obtained on the test were the maximum speeds in the gears which were 9.5, 15, 25.5, 39 and 58 m.p.h.

As the figures obtained on the test show, the Bristol RE gives a good general performance on the road. I found no point on which the design could be criticized. Steering was light, braking

progressive and positive and performance as lively as can be expected on a vehicle of this type. As the test was carried out on a chassis, things such as engine-noise level could not be assessed. The suspension gave a satisfactory ride both fully and partly laden although in both conditions there was a little more "bumpiness" than I would have expected-but not enough for passengers to notice.

In general construction the RE is typical of British high-quality p.s.v. design. Components are robustly made and the chassis should give the long life expected by British operators of this class of machine. There were a number of interesting points about the test chassis which have not been mentioned and which are options. One of these was an exhaust water heater for saloon heating which is fitted in a branch in the exhaust system. Engine-cooling water passes through the unit on its way to the radiator and engine-jacket water heating is augmented. This heat can then be ducted from the radiator to the body saloon. The exhaust gases which are diverted through the heater go through a thermostatically controlled valve with overriding manual control.

It is interesting that Bristol **do not fit a fan on the RE** and on the test vehicle a Varivane radiator shutter was fitted. This is thermostatically operated by a Bristol-designed mechanism and can be fitted with or without the exhaust water heater, but when used with this unit it assists in maintaining optimum engine operating temperature.

List price of the RELL in standard form (with Leyland 0.600 engine and so on) is **£3,335**. Options on the test chassis were the Gardner 6LX which adds £385, fluid clutch and five-speed semi-automatic transmission £364, air suspension £206, exhaust water heater and Varivane shutter £135 15s., and Clayton Dewandre automatic lubrication £87, bringing the total price as tested to £4,512 15s.